

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : IWASAKI ELECTRIC CO LTD

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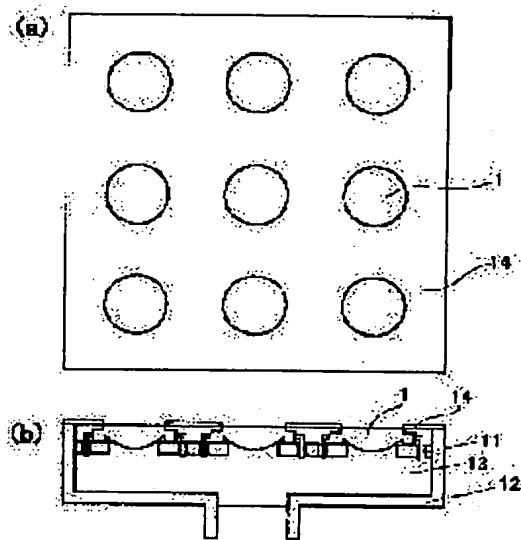
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## (54) LIGHT EMITTING DIODE LAMP

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a light emitting diode lamp which is equipped with a reflection-type light emitting diode as a light source, high in heat dissipating, and capable of effectively using optical energy of light which irradiates a light emitting diode lamp out of reflected light that is radiated from the light emitting diode and reflected from an illuminated body.

**SOLUTION:** A light emitting diode lamp is equipped with light emitting diodes 1, a case 12, sealing material which is filled into the case 12 and seals up the light emitting diodes 1, and a front heat sink 14 with holes bored corresponding to the light emitting diodes 1. The light emitting diode 1 is equipped with a light emitting element, a lead which supplies an electric power to the light emitting element, light transmission material which seals up the light element and a part of the lead, a concave reflecting surface formed confronting the light emitting surface of the light emitting element, and a radiating surface which is formed on the rear of the light emitting element. The lead is led out in a direction vertical to the center axis of the light emitting diode 1, and the front heat sink 14 is formed of material excellent in thermal conductivity and reflectivity.



## LEGAL STATUS

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CLAIMS

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## [Claim(s)]

[Claim 1] In the light emitting diode lamp which has the front heat sink in which two or more light emitting diodes, the case, the closure ingredient that closes said light emitting diode while being filled up with the inside of said case, and the hole corresponding to each light emitting diode were formed The lead section in which said light emitting diode supplies power to a light emitting device and this light emitting device, Said light emitting device, the light transmission nature ingredient which closes a part of lead section, and the concave surface-like reflector countered and formed in the luminescence side side of said light emitting device, Said front heat sink is a light emitting diode lamp with which it has the radial plane formed in the tooth-back side of said light emitting device, and it is pulled out in the perpendicular direction, and said lead section consists of an ingredient with high thermal conductivity and reflection factor to the medial axis of light emitting diode.

[Claim 2] Said front heat sink or case is a light emitting diode lamp according to claim 1 which becomes with a metal with a high reflection factor.

[Claim 3] It is the light emitting diode lamp according to claim 1 or 2 which said light emitting diode forms the perimeter of the radial plane section in closing in, and is characterized by arranging said front heat sink at the perimeter section of said radial plane.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to amelioration of the light emitting diode lamp using the reflective mold light emitting diode emitted outside, after reflecting the light which a light emitting device emits in a concave surface-like reflector.

[0002]

[Description of the Prior Art] the side which closes a light emitting device by light transmission nature resin, and counters this resin as light emitting diode in the luminescence side of a light emitting device -- a concave surface-like reflector -- and the light emitting diode of the reflective mold which carried out the mold of the radial plane to the tooth-back side is known well.

[0003] Moreover, by arranging much this kind of light emitting diodes in matrix, and carrying out a resin seal, the lamp which gave waterproofness is used for various applications, and it is used also as the light source for information displays, the light source for optical instruments, etc. As shown in drawing 4, while a light emitting device is mounted on one lead 41a, a wire connects with lead 41b of another side electrically and the closure of this light emitting device is carried out as this kind of a light emitting diode lamp to the light transmission nature ingredient 42, for example, the transparence epoxy resin of a refractive index 1.5, the radial plane 44 is formed in the side which counters said luminescence side at the concave surface-like reflector 43 and tooth-back side. Moreover, said each lead is pulled out in the perpendicular direction to the medial axis of light emitting diode 40.

[0004] And after each light emitting diode 40 is mounted in a substrate 51 and contained by the case 52, while it fills up the inside of a case with black resin 53, the closure of it is carried out except for the radial plane 46 of light emitting diode 40.

[0005]

[Problem(s) to be Solved by the Invention] The light emitting diode of the lens mold which closed the light emitting device on the other hand to the light transmission nature resin formed in the shape of a lens is also known. In this kind of light emitting diode, a light emitting device is arranged in the center section of resin, and since the lead section which is easy to radiate heat in the heat from a light emitting device is prolonged to the down side (substrate side), it does not have the effective path which radiates heat to the exterior of light emitting diode in the heat which a light emitting device emits.

[0006] On the other hand, the lead section which the above mentioned reflective mold light emitting diode is arranged in the location where a light emitting device is near on the surface of resin, and is easy to radiate heat in the heat from a light emitting device is the height near a front face, and is prolonged in the longitudinal direction. For this reason, it is possible for there to be a path of radiating heat outside from the front face of light emitting diode, and to use as the high lamp of heat dissipation nature the heat which a light emitting device emits compared with said lens mold light emitting diode.

[0007] Moreover, when the improvement in the life property of a lamp which mounted said reflective mold light emitting diode, or the rise of input power is taken into consideration, it is required that the heat dissipation nature of a lamp should be raised further.

[0008] It was made in view of the above and this invention aims at offering the light emitting diode lamp which can use effectively the light energy of the light irradiated to a light emitting diode lamp among the reflected lights which heat dissipation nature was good, were emitted from light emitting diode, using reflective mold light emitting diode as the light source, and were reflected from the irradiated object.

[0009]

[Means for Solving the Problem] The closure ingredient which closes said light emitting diode while this invention is filled up with the inside of two or more light emitting diodes, a case, and said case, It has the front heat sink in which the hole corresponding to each light emitting diode was formed. Said light emitting diode A light emitting device, the lead section which supplies power to a light emitting device, and a light emitting device and the light transmission nature ingredient which closes a part of lead section, It has the concave surface-like reflector countered and formed in the luminescence side side of a light emitting device, and the radial plane formed in the tooth-back side of a light emitting device, and to the medial axis of light emitting diode, it is pulled out in the perpendicular direction and the lead section is characterized by said front heat sink being an ingredient with high thermal conductivity and reflection factor. Moreover, said front heat sink or case becomes with a metal with a high reflection factor. Furthermore, said light emitting diode forms the perimeter of the radial plane section in closing in, and said front heat sink is characterized by being arranged at the perimeter section of said radial plane.

[0010]

[Embodiment of the Invention] Hereafter, this invention is explained based on the example of illustration. The outline front view of the light emitting diode used for the light emitting diode lamp whose drawing 1 (a) is 1 operation gestalt of this invention, the outline front view of the light emitting diode lamp the A-A line outline sectional view of this light emitting diode and whose drawing 2 (a) of drawing 1 (b) are the 1 operation gestalten of this invention, and drawing 2 (b) are the central vertical section outline sectional views of drawing 2 (a).

[0011] A light emitting device 2 is mounted on lead 3a, the reflective mold light emitting diode 1 shown in drawing 1 is electrically connected with one lead 3b by the wire 4, and while the closure of this light emitting device 2 is carried out to the \*\*\*\*\* ingredient 5, for example, the transparence epoxy resin of a refractive index 1.5, the radial plane 7 is formed in the side which counters said luminescence side at the concave surface-like reflector 6 and tooth-back side. Moreover, said leads 3a and 3b are pulled out in the perpendicular direction to the medial axis of light emitting diode.

[0012] And as shown in drawing 2, after it is mounted in a substrate 11 and contained by the case 12 made of PC resin, while light emitting diode 1 fills up the inside of a case 12 with the thermally conductive high black epoxy resin 13 comparatively as a closure ingredient, the closure of it is carried out except for the radial plane 7 of light emitting diode 1. Furthermore, the front heat sink 14, for example, a thin aluminum plate, in which the hole 8 corresponding to the radial plane 7 of each light emitting diode was formed is stuck on the front face (top face of drawing 2 (b)) of the light emitting diode lamp 1 through adhesives etc.

[0013] Thus, a light emitting diode lamp can raise waterproofness and moisture resistance by light emitting diode's being contained by the case made of PC resin, and the closure being carried out with an epoxy resin.

[0014] The heat with which each lead is pulled out in the perpendicular direction to the medial axis of light emitting diode near the radial plane, and the light emitting device emitted the above mentioned reflective mold light emitting diode is mostly conducted in accordance with a lead. For this reason, the remarkable heat dissipation effectiveness can be acquired only by sticking an aluminum plate on a lamp front face.

[0015] In addition, according to the experiment, compared with the lamp, it was checked conventionally that lamp skin temperature falls by about 5 degrees C.

[0016] Although said embodiment explained the aluminum plate as a front heat sink, not only aluminum but heat dissipation nature is good, and what is necessary is just the metal excellent in workability. Moreover, if the thermal conductivity of a ceramic ingredient etc. is a good ingredient, it will not restrict to a metal. Furthermore, although explained as a case made of resin, it is good also as a case made from metals, such as aluminum. When it considers as an aluminum case, the heat dissipation nature from a case side face becomes large, and can make heat dissipation nature of a lamp better.

[0017] Next, other embodiments concerning this invention are explained. Drawing 3 (a) is the outline front view of a light emitting diode lamp, and drawing 3 (b) is the central vertical section outline sectional view of drawing 3 (a). By attaching the same notation, the same components as drawing 1 and drawing 2 omit the explanation.

[0018] That the reflective mold light emitting diode lamp shown in drawing 3 is different from the lamp shown in drawing 2 is a point which has arranged the aluminum plate 21 as a front heat sink around each light emitting diode 1, and has fitted into the front face of the lamp except a radial plane 7. This is because the perimeter of the radial plane section of each light emitting diode is pressing hard and an aluminum plate can be arranged in the perimeter section of a radial plane. This lamp is closed with an epoxy resin etc., where the aluminum plate 21 is attached to the substrate 12 which mounted each light emitting diode. Since spacing of a lead and an aluminum plate can be narrowed while being able to simplify by this the activity which sticks an aluminum plate, improvement in heat dissipation nature can be aimed at.

[0019] in addition — although, as for an epoxy resin, the adhesive property can perform adhesion with an aluminum plate sufficient also by what has a smooth front face since it is large — the front face of an aluminum plate — rough \*\*\*\* — the increase of adhesion area, bond strength, and endurance can be increased by things etc.

[0020] In addition, this invention is not limited to the above-mentioned operation gestalt, and various modification is possible for it within the limits of the summary.

[0021]

[Effect of the Invention] As explained above, according to this invention, heat dissipation nature is good and the absorption of light can obtain the light emitting diode lamp which there are and irradiates light energy efficiently to an irradiated object. [ few ] Moreover, workability is good and the lamp excellent in the heat dissipation property is obtained.

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[Translation done.]

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to amelioration of the light emitting diode lamp using the reflective mold light emitting diode emitted outside, after reflecting the light which a light emitting device emits in a concave surface-like reflector.

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PRIOR ART

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[0003] Moreover, by arranging much this kind of light emitting diodes in matrix, and carrying out a resin seal, the lamp which gave waterproofness is used for various applications, and it is used also as the light source for information displays, the light source for optical instruments, etc. As shown in drawing 4, while a light emitting device is mounted on one lead 41a, a wire connects with lead 41b of another side electrically and the closure of this light emitting device is carried out as this kind of a light emitting diode lamp to the light transmission nature ingredient 42, for example, the transparence epoxy resin of a refractive index 1.5, the radial plane 44 is formed in the side which counters said luminescence side at the concave surface-like reflector 43 and tooth-back side. Moreover, said each lead is pulled out in the perpendicular direction to the medial axis of light emitting diode 40.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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[0007] Moreover, when the improvement in the life property of a lamp which mounted said reflective mold light emitting diode, or the rise of input power is taken into consideration, it is required that the heat dissipation nature of a lamp should be raised further.

[0008] It was made in view of the above and this invention aims at offering the light emitting diode lamp which can use effectively the light energy of the light irradiated to a light emitting diode lamp among the reflected lights which heat dissipation nature was good, were emitted from light emitting diode, using reflective mold light emitting diode as the light source, and were reflected from the irradiated object.

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## MEANS

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the outline front view of light emitting diode and this A-A line outline sectional view which are used for the light emitting diode lamp which is 1 operation gestalt of this invention.

[Drawing 2] Similarly they are the outline front view of a light emitting diode lamp, and this central vertical section outline sectional view.

[Drawing 3] It is the outline front view of a light emitting diode lamp and this central vertical section outline sectional view which are other operation gestalten of this invention.

[Drawing 4] They are the outline front view of the conventional light emitting diode lamp, and this central vertical section outline sectional view.

[Description of Notations]

- 1 Light Emitting Diode
- 2 Light Emitting Device
- 3a, 3b Lead
- 4 Wire
- 5 Light Transmission Nature Ingredient
- 6 Concave Surface-like Reflector
- 7 Radial Plane
- 8 Hole
- 11 Substrate
- 12 Case
- 13 Black Resin
- 14 Front Heat Sink
- 21 Aluminum Plate

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[Translation done.]

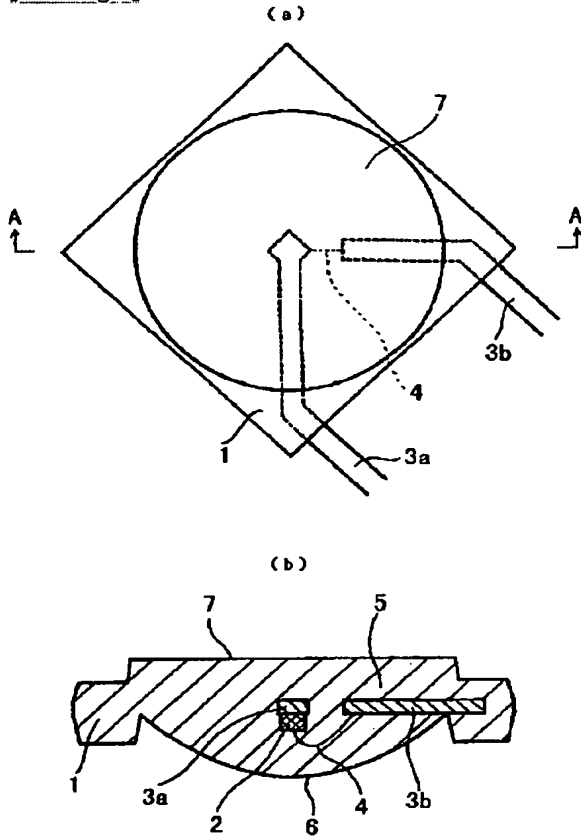
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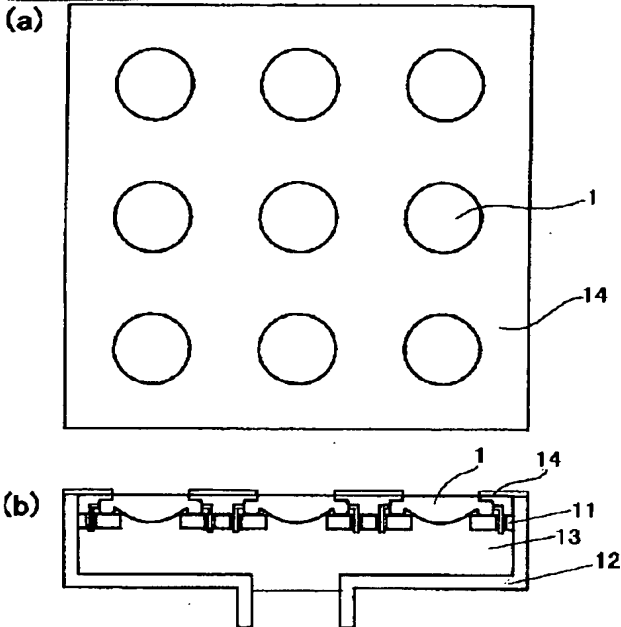
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## DRAWINGS

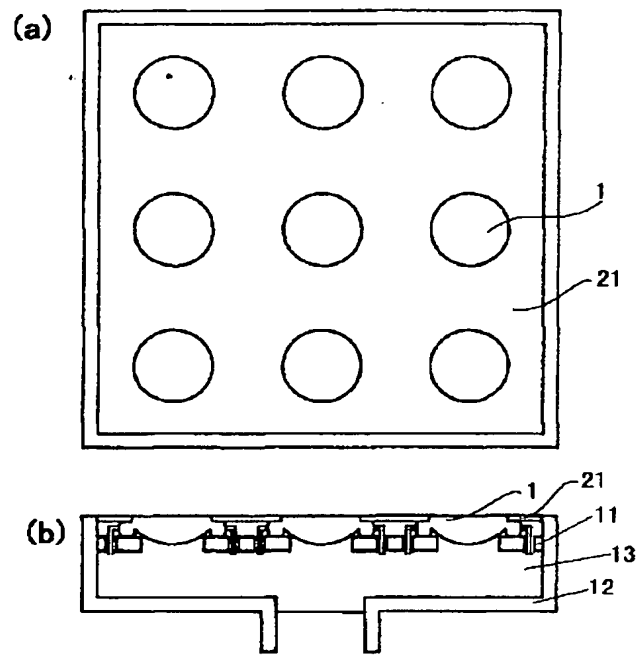
[Drawing 1]



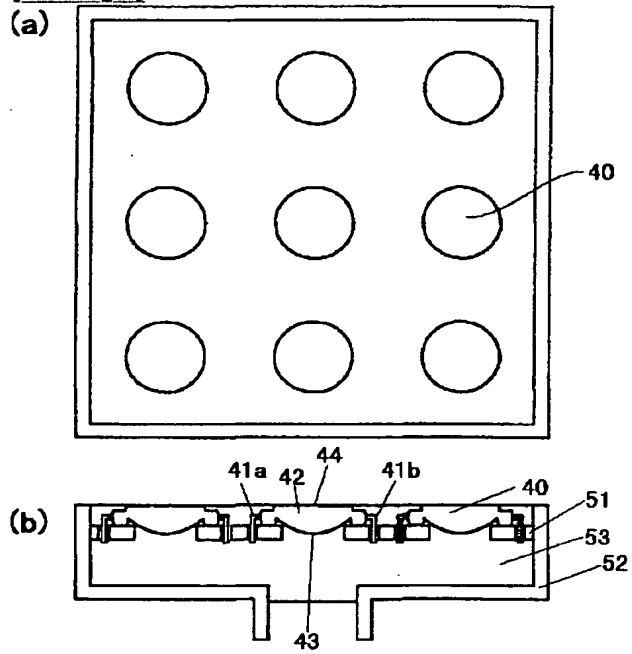
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

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(71) 出願人 000000192

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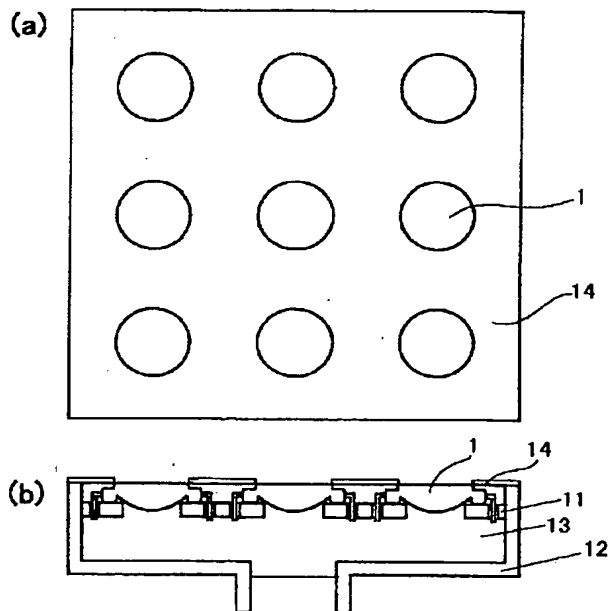
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(54) 【発明の名称】 発光ダイオードランプ

(57) 【要約】

【目的】 本発明は、反射型発光ダイオードを光源として用い、放熱性が良好で、発光ダイオードから放射され被照射体から反射された反射光のうち、発光ダイオードランプへ照射される光の光エネルギーを有効に利用することができる発光ダイオードランプを提供することを目的とする。

【構成】 本発明は、複数の発光ダイオードと、ケースと、前記ケース内を充填すると共に前記発光ダイオードを封止する封止材料と、各発光ダイオードに対応した穴が形成された前面放熱板を有し、前記発光ダイオードは、発光素子と、発光素子に電力を供給するリード部と、発光素子とリード部の一部を封止する光透過性材料と、発光素子の発光面側に対向して形成した凹面状反射面と、発光素子の背面側に形成した放射面とを有し、リード部は発光ダイオードの中心軸に対して垂直な方向に引き出されており、かつ、前記前面放熱板は熱伝導性と反射率が高い材料であることを特徴とする。



## 【特許請求の範囲】

【請求項 1】複数の発光ダイオードと、ケースと、前記ケース内を充填すると共に前記発光ダイオードを封止する封止材料と、各発光ダイオードに対応した穴が形成された前面放熱板を有する発光ダイオードランプにおいて、前記発光ダイオードは、発光素子と、該発光素子に電力を供給するリード部と、前記発光素子とリード部の一部を封止する光透過性材料と、前記発光素子の発光面側に対向して形成した凹面状反射面と、前記発光素子の背面側に形成した放射面とを有し、前記リード部は発光ダイオードの中心軸に対して垂直な方向に引き出されており、かつ、前記前面放熱板は、熱伝導性と反射率が高い材料よりなる発光ダイオードランプ。

【請求項 2】前記前面放熱板またはケースは、反射率の高い金属によりなる請求項 1 記載の発光ダイオードランプ。

【請求項 3】前記発光ダイオードは、放射面部の周囲を肉薄に形成し、前記前面放熱板は、前記放射面の周囲部に配置されていることを特徴とする請求項 1 又は 2 記載の発光ダイオードランプ。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、発光素子が発する光を凹面状反射面で反射した後外部に放射する反射型発光ダイオードを用いた発光ダイオードランプの改良に関する。

## 【0002】

【従来の技術】発光ダイオードとして、発光素子を光透過性樹脂で封止し、該樹脂に発光素子の発光面に対向する側に凹面状反射面をかつ背面側に放射面をモールドした反射型の発光ダイオードがよく知られている。

【0003】また、この種の発光ダイオードをマトリクス的に多数配列し樹脂封止することにより、防水性を持たせたランプが種々の用途に用いられており、情報表示装置用光源、光学機器用光源等としても利用されている。この種の発光ダイオードランプとして、図 4 に示すように、発光素子が一方のリード 41a 上にマウントされ、他方のリード 41b とはワイヤにより電氣的に接続され、該発光素子が光透過性材料、例えば屈折率 1.5 の透明エポキシ樹脂 42 に封止されると共に、前記発光面に対向する側に凹面状反射面 43、かつ背面側に放射面 44 が形成されている。又、前記各リードは発光ダイオード 40 の中心軸に対して垂直な方向に引き出されている。

【0004】そして、各発光ダイオード 40 は基板 51 に実装され、かつケース 52 に収納された後、黒色の樹脂 53 にてケース内を充填すると共に、発光ダイオード 40 の放射面 46 を除き封止されている。

## 【0005】

【発明が解決しようとする課題】一方、発光素子をレン

ズ状に形成した光透過性樹脂に封止したレンズ型の発光ダイオードも知られている。この種の発光ダイオードにおいて、発光素子は樹脂の中央部に配置され、発光素子からの熱を放熱しやすいリード部は下側（基板側）に延びているので、発光素子が発する熱を発光ダイオードの外部に放熱する有効な経路がない。

【0006】これに対して、前記した反射型発光ダイオードは発光素子が樹脂の表面に近い位置に配置され、かつ発光素子からの熱を放熱しやすいリード部は、表面に近い高さで、横方向に延びている。このために、発光素子が発する熱を発光ダイオードの表面から外部に放熱するという経路があり、前記レンズ型発光ダイオードに比べて、放熱性の高いランプとすることが可能である。

【0007】また、前記反射型発光ダイオードを実装したランプの寿命特性の向上あるいは入力電力のアップ等を考慮した場合、更にランプの放熱性を高めることが要求されている。

【0008】本発明は前記に鑑みてなされたもので、反射型発光ダイオードを光源として用い、放熱性が良好で、発光ダイオードから放射され被照射体から反射された反射光のうち、発光ダイオードランプへ照射される光の光エネルギーを有効に利用することができる発光ダイオードランプを提供することを目的とする。

## 【0009】

【課題を解決するための手段】本発明は、複数の発光ダイオードと、ケースと、前記ケース内を充填すると共に前記発光ダイオードを封止する封止材料と、各発光ダイオードに対応した穴が形成された前面放熱板を有し、前記発光ダイオードは、発光素子と、発光素子に電力を供給するリード部と、発光素子とリード部の一部を封止する光透過性材料と、発光素子の発光面側に対向して形成した凹面状反射面と、発光素子の背面側に形成した放射面とを有し、リード部は発光ダイオードの中心軸に対して垂直な方向に引き出されており、かつ、前記前面放熱板は熱伝導性と反射率が高い材料であることを特徴とする。又、前記前面放熱板またはケースは、反射率の高い金属によりなる。更に、前記発光ダイオードは、放射面部の周囲を肉薄に形成し、前記前面放熱板は、前記放射面の周囲部に配置されていることを特徴とする。

## 【0010】

【発明の実施の形態】以下、本発明を図示の実施例に基づき説明する。図 1 (a) は本発明の一実施形態である発光ダイオードランプに使用される発光ダイオードの概略正面図、図 1 (b) は該発光ダイオードの A-A 線概略断面図、図 2 (a) は本発明の一実施形態である発光ダイオードランプの概略正面図、図 2 (b) は図 2 (a) の中央縦断概略断面図である。

【0011】図 1 に示す反射型発光ダイオード 1 は、発光素子 2 がリード 3a 上にマウントされ、一方のリード 3b とはワイヤ 4 により電氣的に接続され、該発光素子

2はは光透過性材料5、例えば屈折率1.5の透明エポキシ樹脂に封止されると共に前記発光面に対向する側に凹面状反射面6、かつ背面側に放射面7が形成されている。又、前記リード3a、3bは発光ダイオードの中心軸に対して垂直な方向に引き出されている。

【0012】そして、図2に示すように、発光ダイオード1は基板11に実装され、かつ、PC樹脂製のケース12に収納された後、封止材料として比較的熱伝導性の高い黒色のエポキシ樹脂13にてケース12内を充填すると共に発光ダイオード1の放射面7を除き封止されている。さらに、発光ダイオードランプ1の前面(図2(b)の上面)には、各発光ダイオードの放射面7に対応した穴8を形成した前面放熱板14、例えば薄いアルミニウム板が接着剤等を介して貼付してある。

【0013】このように、発光ダイオードがPC樹脂製ケースに収納され、エポキシ樹脂により封止されることによって、発光ダイオードランプは、防水性、耐湿性を高めることができる。

【0014】前記した反射型発光ダイオードは、各リードが放射面の近くを発光ダイオードの中心軸に対して垂直な方向に引き出されており、発光素子が発した熱は大部分リードに沿って伝導される。このため、ランプ表面にアルミ板を貼るだけで顕著な放熱効果を得ることができる。

【0015】なお、実験によると、従来ランプと比べて、ランプ表面温度は約5℃低下することが確認された。

【0016】前記実施態様では、前面放熱板としてアルミ板について説明したが、アルミに限らず放熱性が良く、加工性が優れた金属であればよい。又、セラミック材料等の熱伝導性が良好な材料であれば、金属に限らない。更に、樹脂製のケースとして説明したが、アルミ等の金属を材料とするケースとしてもよい。アルミケースとした場合、ケース側面からの放熱性が大きくなり、ランプの放熱性をより良好とすることができる。

【0017】次に、本発明に係る他の実施態様について説明する。図3(a)は発光ダイオードランプの概略正面図、図3(b)は図3(a)の中央縦断概略断面図である。図1及び図2と同一部品は同一記号を付すことにより、その説明を省略する。

【0018】図3に示す反射型発光ダイオードランプが図2に示すランプと相違するのは、前面放熱板としてのアルミ板21を各発光ダイオード1の周囲に配置し、放射面7を除くランプの表面に嵌合している点である。これは、各発光ダイオードの放射面部の周囲が肉薄になっ

ており、放射面の周囲部にアルミ板を配置することができるからである。かかるランプは、各発光ダイオードを実装した基板12にアルミ板21を付けた状態でエポキシ樹脂等により封止する。これにより、アルミ板を貼付する作業を簡略化することができると共に、リードとアルミ板の間隔を狭くできるので、放熱性の向上を図ることができる。

【0019】なお、エポキシ樹脂は接着性が大きいので、アルミ板は表面が滑らかなものでも十分な接着を行なえるが、アルミ板の表面を粗らすことなどにより、接着面積を増し、接着強度や耐久性を増すことができる。

【0020】なお、本発明は上記実施形態に限定されるものではなく、その要旨の範囲内において種々の変更が可能である。

#### 【0021】

【発明の効果】以上説明したように、本発明によれば、放熱性が良好で、光の吸収が少なく被照射体に対して光エネルギーを効率よく照射する発光ダイオードランプを得ることができる。又、作業性が良好で、放熱特性が優れたランプが得られる。

#### 【図面の簡単な説明】

【図1】本発明の一実施形態である発光ダイオードランプに使用される発光ダイオードの概略正面図及び同A-A線概略断面図である。

【図2】同じく発光ダイオードランプの概略正面図及び同中央縦断概略断面図である。

【図3】本発明の他の実施形態である発光ダイオードランプの概略正面図及び同中央縦断概略断面図である。

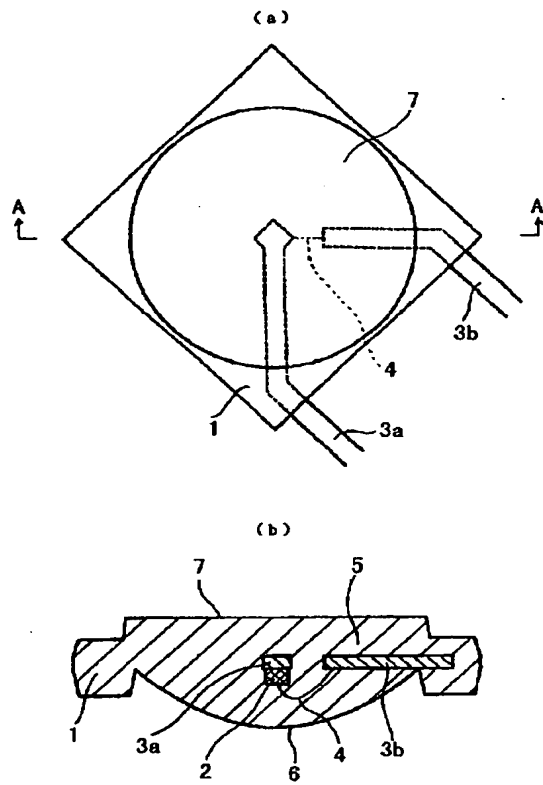
【図4】従来の発光ダイオードランプの概略正面図及び同中央縦断概略断面図である。

#### 【符号の説明】

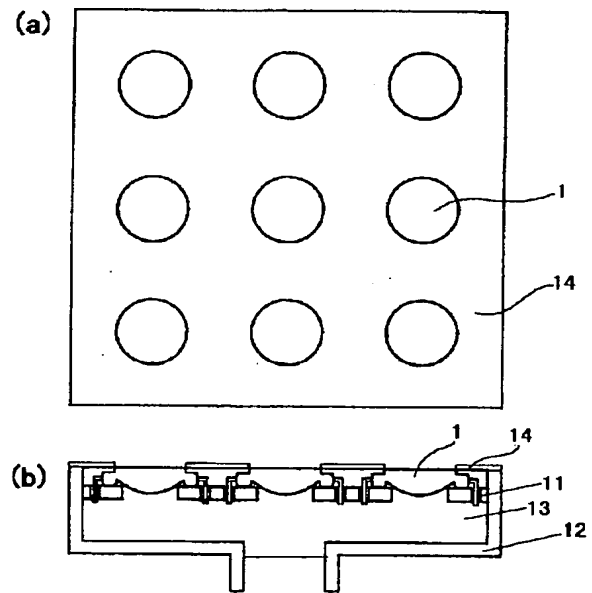
- 1 発光ダイオード
- 2 発光素子
- 3a, 3b リード
- 4 ワイヤ
- 5 光透過性材料
- 6 凹面状反射面
- 7 放射面
- 8 穴
- 11 基板
- 12 ケース
- 13 黒色樹脂
- 14 前面放熱板
- 21 アルミ板



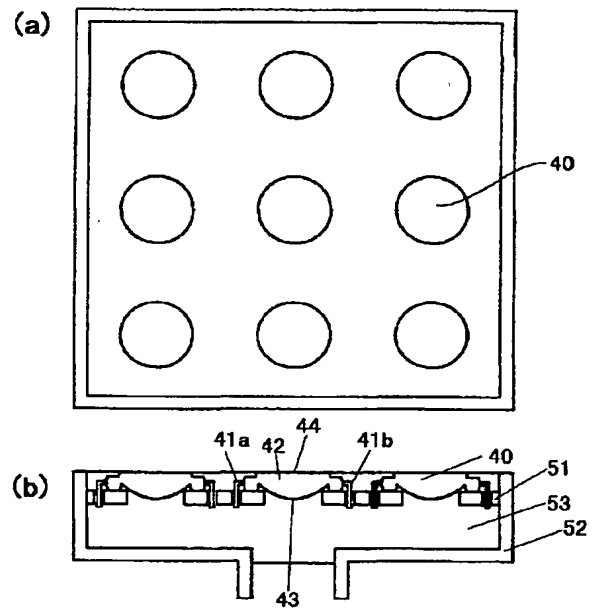
【図1】



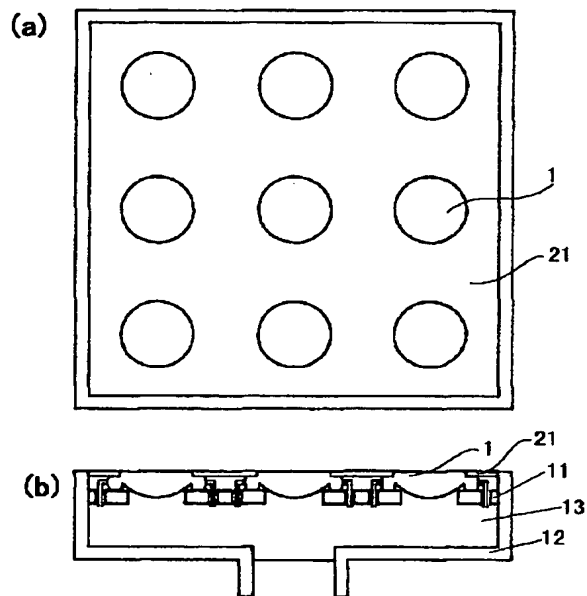
【図2】



【図4】



【図3】



フロントページの続き

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DA44 DC07 DC23 DC76 DC83  
FF11